

AMENDMENT

SERIAL NO.: 09/050,113

REMARKS

Claims 1-14, 36 and 37 are pending in this application. By this Amendment, claims 1, 2, 9, 11, 12, 36 and 37 have been amended. The applicant respectfully submits that no new matter has been added. It is believed that this Response is fully responsive to the Office Action dated February 13, 2001.

Allowable Subject Matter:

Applicant gratefully acknowledges the Examiner's indication that independent claims 1 and 36 are allowable. (See page 5 of the outstanding Action).

Claim Objections:

Claims 1, 4 and 36 stand objected to due to minor informalities.

This objection is respectfully traversed.

Applicant respectfully submit that the amendments to claims 1 and 36 obviate the objection of claims 1, 4 and 36. Accordingly, withdrawal of the objection of claims 1, 4 and 36 is respectfully solicited.

35 U.S.C. §112, First Paragraph, Rejection:

Claims 9-11, 13 and 37 stand rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way to reasonably convey to

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one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

This rejection is respectfully traversed.

More specifically, the Examiner contends that “the specification does not show support for the limitation that the contact hole has a second width which is the same as the width subtracted twice a width of the sidewall insulation film from the space between the adjacent conductor patterns/wordlines/bitlines at the bottom of the contact hole.”¹

However, the Examiner’s position is clearly overcritical. That is, in Figure 1, a first width, the distance between the two sidewall insulation films 32 at the top of the contact hole, is larger than the distance between the two conductor patterns 20.

In addition, in Figure 1, a second width, the distance between the two sidewall insulation films 32 of the bottom of the contact hole, is substantially the same as the width between the two conductor patterns 20 minus the width of both sidewall insulation film 32.

Moreover, claims 9, 11 and 37 are amended to clarify the claimed invention. According to the amendments, that the end of the contact hole is defined by the sidewall insulation film. Thus,

^{1/} Please see, line 19, page 2 - line 2, page 3 of the outstanding Action.

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it is apparent from, e.g., FIG. 1 of the present application that the width of the contact hole at the bottom thereof corresponds to a width subtracted twice a width of the sidewall insulation film from the space between the adjacent word lines.

Applicant respectfully submits that the above arguments and amendments to claims 9, 11 and 37 overcome the rejection of claims 9-11, 13 and 37 under 35 U.S.C. §112, first paragraph. Accordingly, withdrawal of the rejection of claims 9-11, 13 and 37 under 35 U.S.C. §112, first paragraph, is respectfully solicited.

35 U.S.C. §112, Second Paragraph, Rejection:

Claims 2, 3, 5-8, 12 and 14 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

This rejection is respectfully traversed.

The Examiner states that the specification and drawings disclose that the first insulation film is not present between the two adjacent conductor patterns because of the contact hole. However, as shown in, e.g., FIGs. 8A, 9D-9E and 13B, the contact hole 70 is located between the adjacent conductor patterns 56. The first insulation film 64 is filling spaces between the two adjacent conductor patterns 56 where the contact hole 70 is not formed.

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The Examiner also states that the specification and drawings disclose that the first insulation film does extend over the etching stopper film. It extends above the film and beyond the etching stopper film where the contact hole is not present. However, as shown in, e.g., FIGs. 8A and 9D-9E, the first insulation film 64 does not extend over the etching stopper film.

Claims 2 and 12 as amended to clarify the claimed invention. According to the amendments, the first insulation film is filling spaces between said plurality of conductor patterns where the contact hole is not formed.

Applicant respectfully submits that the above arguments and amendments to claims 2 and 12 overcome the rejection of claims 2, 3, 5-8, 12 and 14 under 35 U.S.C. §112, second paragraph. Accordingly, withdrawal of the rejection of claims 2, 3, 5-8, 12 and 14 under 35 U.S.C. §112, second paragraph, is respectfully solicited.

As To The Merits:

As to the merits of this case, the Examiner sets forth the following rejections:

(1) claims 2, 3, and 5-8 stand rejected under 35 U.S.C. §102(b) based on **Hiroshi** (JP 08-037171(A)); and

(2) claims 9-14 and 37 stand rejected under 35 U.S.C. §103(a) based on **Hiroshi**.

Both of these rejections are respectfully traversed.

Claims 2 and 12 and their respective dependent claims include the feature that the insulation film fills the spaces between the two conductor patterns where the contact hole is not formed and does not extend over the etching stopper film. Based on this feature, according to the present invention, micronized contact holes can be formed without forming the micronized photoresist pattern (see, e.g., page 37, line 9 - page 38, line 8 of the specification of the present application).

Hiroshi discloses the insulation film 2 which fills the space between the two conductor patterns 2 (see, e.g., FIG. 1, of Hiroshi). However, in Hiroshi, the insulation film 2 extends over the etching stopper film 6, (see, e.g., FIG. 1 of Hiroshi). Hiroshi neither teaches nor suggests that the insulation film is not extending over the etching stopper film.

Thus, Hiroshi is clearly different from the claimed invention and does not provide any motivation for the present invention.

Claims 9, 11, 37 and their respective dependent claims include the feature that the contact holes has at a top of the contact hole a first width which is larger than a space between two conductor patterns, and at a bottom of the contact a second width which is substantially the same as a width subtracted twice a width of the sidewall insulation film from the space between the two conductor patterns. Based on this feature, the present invention can provide the useful effect that the size of the contact hole does not change even when disalignment takes place in the lithography step for

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opening the contact hole (see First Embodiment of the present application).

On the other hand, in Hiroshi, a width at a top of the contact hole 9 is smaller than a space between the two conductor patterns 5. A width at a bottom of the contact hole 9 is smaller than a width subtracted twice a width of the sidewall insulation film 10, 11 or 12 from the space between the two conductor patterns 5 (see, e.g., FIG. 1 of Hiroshi). The above described effect can not be achieved by the constitution of Hiroshi.

Thus, Hiroshi is clearly different from the claimed invention and does not provide any motivation for the present invention.

Thus, it is respectfully asserted that the prior art fails to teach or suggest recitations of claims 1-14, 36 and 37 requested that the Examiner allow these claims, along with the entire application, to issue. Accordingly, withdrawal of the rejection of claims 1-14 and 36 under 35 U.S.C. §102(b) and §103(a) is respectfully solicited.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney, at the telephone number indicated below, to arrange for an interview to expedite the disposition of this case.

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In the event this response is not timely filed, Applicant petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, WESTERMAN, HATTORI
MCLELAND & NAUGHTON, LLP

A handwritten signature in black ink, appearing to read 'TEB', with a stylized flourish at the end.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1, 2, 9, 11, 12, 36 and 37 have been amended as follows:

1. (Three Times Amended) A semiconductor device comprising:

a base substrate;

a first conducting film formed over the base substrate and including two conductor patterns adjacent to each other;

an etching stopper film covering [an] each upper surface of the two conductor patterns;

a first insulation film formed over the etching stopper film and the base substrate;

a [contract] contact hole, located between the two conductor patterns, reaching the base substrate through the first insulation film, wherein an end of the contact hole is positioned on the etching stopper film; and

a sidewall insulation film, formed on an inner wall of the first insulation film, each side wall of the two conductor patterns, and each side wall of the etching stopper film in the contact hole,

wherein each of said etching stopper films is completely covered by said first insulation film and said respective sidewall insulation film.

2. (Three Times Amended) A semiconductor device comprising:

a base substrate;

a first conducting film formed over the base substrate and including a plurality of conductor patterns adjacent to each other;

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an etching stopper film covering an upper surface of the conductor patterns;

a contact hole located between the adjacent conductor patterns and having an end thereof defined by the conductor patterns;

a first insulation film which is filling spaces between said plurality of conductor patterns where the contact hole is not formed and not extending over the etching stopper film;

[a contact hole located between the adjacent conductor patterns and having an end thereof defined by the conductor patterns;] and

a sidewall insulation film formed on an inner wall of the contact hole so that side walls of the conductor pattern and the etching stopper film are covered.

9. (Three Times Amended) A semiconductor device comprising:

a semiconductor substrate;

a plurality of word lines formed over the semiconductor substrate and extended in a first direction;

an etching stopper film covering upper surfaces of the word lines;

a first insulation film formed over the etching stopper film and the semiconductor substrate;

a contact hole, located between the word lines, reaching the semiconductor substrate through the first insulation film[, wherein an end of the contact hole is positioned on the etching stopper film]; and

a sidewall insulation film, formed in the contact hole, covering a side wall of the first insulation film, side walls of the word lines and side walls of the etching stopper film, the sidewall insulation film defining an end of the contact hole,

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the contact hole having a first width which is larger than a space between the adjacent word lines at a top of the contact hole and a second width which is substantially the same as a width subtracted twice a width of the sidewall insulation film from the space between adjacent word line at a bottom of the contact hole.

11. (Three Times Amended) A semiconductor device comprising:
- a semiconductor substrate;
 - a plurality of word lines formed over the semiconductor substrate and extended in a first direction;
 - a first insulation film formed over the word lines and the semiconductor substrate;
 - a plurality of bit lines formed over the first insulation film and extended in a second direction;
 - an etching stopper film covering upper surfaces of the bit lines;
 - a second insulation film formed over the etching stopper film and the first insulation film;
 - a contact hole, located between the adjacent bit lines[, having an end thereof positioned on the etching stopper film];
 - a sidewall insulation film, formed in the contact hole, covering a side wall of the second insulation film, side walls of the bit lines and side walls of the etching stopper film, the sidewall insulation film defining an end of the contact hole; and
 - a capacitor having one electrode connected to the semiconductor substrate through the contact hole,
 - the contact hole having a first width which is larger than a space between the adjacent bit

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lines at a top of the contact hole and a second width which is substantially the same as a width substrate twice a width of the sidewall insulation film from the space between the adjacent bit lines at a bottom of the contact hole.

12. (Three Times Amended) A semiconductor device comprising:
- a semiconductor substrate;
 - a plurality of word lines formed over the semiconductor substrate and extended in a first direction;
 - a first insulation film formed over the word lines and the semiconductor substrate;
 - a plurality of bit lines formed over the first insulation film and extended in a second direction;
 - an etching stopper film covering upper surfaces of the bit lines;
 - a contact hole located between the adjacent bit lines, having ends thereof defined by the bit lines;
 - a second insulation film which is filling spaces between said plurality of bit lines where the contact hole is not formed and not extending over the etching stopper film;
 - [a contact hole, located between the adjacent bit lines, having ends thereof defined by the bit lines;]
 - a sidewall insulation film, formed in the contact hole, covering a side wall of the second insulation film, side walls of the bit lines and side walls of the etching stopper film; and
 - a capacitor having one electrode connected to the semiconductor substrate through the contact hole.

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36. (Twice Amended) A semiconductor device comprising:

- a base substrate;
- a first conducting film formed over the base substrate and including two conductor patterns adjacent to each other;
- an etching stopper film covering each upper surface of the two conductor patterns;
- a first insulation film formed over the etching stopper film and the base substrate;
- a contact hole, located between the two conductor patterns, reaching the base substrate through the first insulation [firm] film, wherein an end of the [contract] contact hole is positioned on the etching stopper film; and
- a sidewall insulation film formed on an inner wall of the first insulation film, each side wall [is] of the two conductor patterns, and each side wall of the etching stopper film in the contact hole, in which

the end of the contact hole is defined by four sides including a first pair of sides which are opposed to each other and a second pair of sides which are opposed to each other,

- the first pair of sides is defined by the conductor patterns, and
- the second pair of sides is defined by the first insulation film.

37. (Amended) A semiconductor device comprising:

- a base substrate;
- a first conducting film formed over the base substrate and including two conductor patterns adjacent to each other;
- an etching stopper film covering each upper surface of the two conductor patterns;

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a first insulation film formed over the etching stopper film and the base substrate;

a contact hole, located between the two conductor patterns, reaching the base substrate through the first insulation film[, wherein an end of the contact hole is positioned on the etching stopper film]; and

a sidewall insulation film formed on an inner wall of the first insulation film, each side wall of the two conductor patterns, and each side wall of the etching stopper film in the contact hole, the sidewall insulation film defining an end of the contact hole,

the contact hole having a first width which is larger than a space between the two conductor patterns at a top of the contact hole and a second width which is substantially the same as a width subtracted twice a width of the sidewall insulation film from the space between the two conductor patterns at a bottom of the contact hole.